

Effluent Scrubbing of Engine Exhaust of a Nuclear Thermal Propulsion Engine

Completed Technology Project (2013 - 2014)



Project Introduction

The Institute for Clean Energy Technology (ICET) at MSU already supports long-standing high-efficiency nuclear particulate air (HEPA) filtration research as well as other related research. This project will explore nuclear effluent scrubbing to support Nuclear Thermal Propulsion (NTP). The project will evaluate NTP engine exhaust scrubbing requirements and define corresponding filter and scrubbing system size requirements for selecting filter material, operating temperature range, static and trans-filter pressure differential maximum/minimum, and associated effluent flow rate. The project will provide technical assistance in establishing facility requirements; i.e., pre & post-test safety, filter inspection and hazard mitigation. Scrubber system operational constraints with selected filter technologies, post-test/operations, facility safety, filter replacement disposal requirements, and facility cost estimates will be better developed at the project's conclusion.

The goal was to advance the technical immaturity of the direct gas treatment (effluent scrubbing) approach; and to investigate filtering feasibility and identify design requirements. The scope of this effort includes the following: (1) identify and research the latest technologies available for radioactive effluent scrubbing that would work on the magnitude required for testing an NTP engine and stage vehicle development (i.e., up to 30 lbs/sec hydrogen flow rate for 1 hour duration) and (2) scope and estimate costs required for work and effort necessary to develop a hydrogen scrubber system to support NASA's NTP engine and stage development anticipated goals.

Anticipated Benefits

The effluent scrubbing of engine exhaust of a nuclear thermal propulsion engine will directly benefit NASA funded missions that require projected long term space flight and advanced nuclear propulsion technologies.



MSU Institute for Clean Energy

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Stennis Space Center (SSC)

Responsible Program:

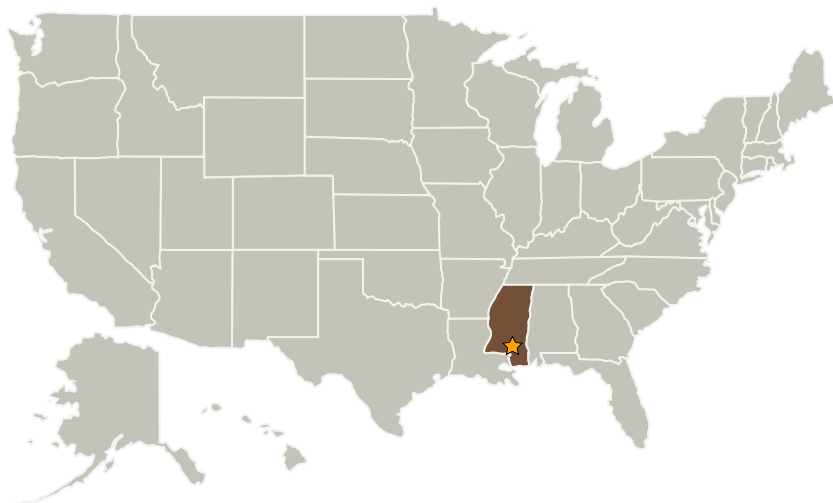
Center Innovation Fund: SSC CIF

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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Stennis Space Center(SSC)	Lead Organization	NASA Center	Stennis Space Center, Mississippi

Primary U.S. Work Locations

Mississippi

Images

ICET INSTITUTE FOR CLEAN
ENERGY TECHNOLOGY
MISSISSIPPI STATE UNIVERSITY

Institute for Clean Energy Technology

MSU Institute for Clean Energy
(<https://techport.nasa.gov/image/2748>)

Project Management

Program Director:

Michael R Lapointe

Program Manager:

Ramona E Travis

Project Manager:

Lauren W Underwood

Principal Investigator:

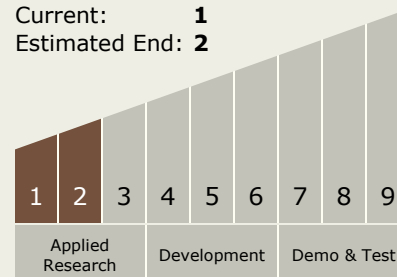
David J Coote

Co-Investigator:

Charles Waggoner

Technology Maturity (TRL)

Start: **1**
Current: **1**
Estimated End: **2**



Technology Areas

Primary:

- TX01 Propulsion Systems
 - TX01.4 Advanced Propulsion
 - TX01.4.3 Nuclear Thermal Propulsion